

REMARKS

In the non-final Office Action, the Examiner rejects claims 10-12, 17-20, and 27-33 under 35 U.S.C. § 103(a) as anticipated by ANDERSSON et al. (U.S. Patent Application No. 7,023,846 B1) in view of KADAMBI et al. (U.S. Patent Application No. 7,103,055 B2).; and rejects claims 21-26 under 35 U.S.C. § 103(a) as unpatentable over AGGARWAL et al. (U.S. Patent Application No. 6,330,614 B1) in view of KADAMBI et al. Applicants respectfully traverse the rejections.

By way of the present amendment, Applicant cancels claims 20 and 30-33 without prejudice or disclaimer and amends claims 10, 17, 26, and 27 to improve form. No new matter has been introduced by way of the present amendment. Claims 10-12, 17-19, and 21-29 are pending.

**Rejection under 35 U.S.C. § 103(a) based on ANDERSSON et al. and
KADAMBI et al.**

Pending claims 10-12, 17-20, and 27-29 stand rejected under 35 U.S.C. § 103(a) as allegedly unpatentable over ANDERSSON et al. and KADAMBI et al. Applicants respectfully traverse this rejection.

Amended independent claim 10 is directed to a method of routing packets by a networking device. The method includes generating a first forwarding table; generating a second forwarding table; programming a filter to perform a first lookup operation in the first forwarding table if a first field value of a received packet meets one or more conditions of a first set of conditions; and programming the filter to initiate a second lookup operation in the second forwarding table if the first field value does not meet one or more conditions of the first set of conditions; receiving a particular packet;

determining, by the filter, whether the first field value of the particular packet meets the one or more conditions of the first set of conditions; performing the first lookup operation in the first forwarding table, without performing the second lookup operation in the second forwarding table, to identify a first egress port, of the networking device, when the first field value of the particular packet meets the one or more conditions; performing the second lookup operation in the second forwarding table, without performing the first lookup operation in the first forwarding table, to identify a second egress port, of the networking device, when the first field value of the particular packet does not meet the one or more conditions; and forwarding the particular packet to the identified first egress port or the identified second egress port. ANDERSSON et al. and KADAMBI et al., whether taken alone or in any reasonable combination, do not disclose or suggest this combination of features.

For example, ANDERSSON et al. and KADAMBI et al. do not disclose or suggest programming a filter to perform a first lookup operation in a first forwarding table if a first field value of a received packet meets one or more conditions of a first set of conditions and programming the filter to initiate a second lookup operation in a second forwarding table if the first field value does not meet one or more conditions of the first set of conditions, as recited in amended claim 10. The Examiner admits that ANDERSSON et al. does not disclose these features (Office Action, pg. 4). To remedy this deficiency, the Examiner relies on elements 17-1 to 17-7; Fig. 14; column 20, lines 46-56; column 20, line 65 – column 21, line 15; column 21, lines 25-44; and column 22, lines 22-52 (which describes elements 17-1 to 17-7) of KADAMBI et al. as allegedly

disclosing these features of claim 10 (Office Action, pg. 4). Applicants disagree with the Examiner's interpretation of KADAMBI et al.

At Fig. 14, KADAMBI et al. discloses that when the first sixteen bytes of a packet arrive in an input FIFO, and address resolution request is sent, which initiates lookup in the address resolution logic/level 3(ARL/L3) tables (column 16, lines 51-56). While Fig. 14 of KADAMBI et al. discloses initiating a lookup in tables, KADAMBI et al. does not disclose or suggest initiating lookups in different tables based on one or more conditions of the packet. Therefore, Fig. 14 of KADAMBI et al. cannot disclose or suggest programming a filter to perform a first lookup operation in a first forwarding table if a first field value of a received packet meets one or more conditions of a first set of conditions and programming the filter to initiate a second lookup operation in a second forwarding table if the first field value does not meet one or more conditions of the first set of conditions, as recited in amended claim 10.

At column 20, lines 46-56, KADAMBI et al. discloses:

FFP 141 is essentially a state machine driven programmable rules engine. The filters used by the FFP are 64 (sixty-four) bytes wide, and are applied on an incoming packet; any offset can be used, however, a preferred embodiment uses an offset of zero, and therefore operates on the first 64 bytes, or 512 bits, of a packet. The actions taken by the filter are tag insertion, priority mapping, TOS tag insertion, sending of the packet to the CPU, dropping of the packet, forwarding of the packet to an egress port, and sending the packet to a mirrored port. The filters utilized by FFP 141 are defined by rules table 22. Rules table 22 is completely programmable by CPU 52, through CMIC 40.

This section of KADAMBI et al. discloses filters, which are defined by a rules table, that are applied on an incoming packet. This section of KADAMBI et al. does not disclose or suggest that the filters are programmed to perform a lookup operation in different forwarding tables based upon one or more conditions of the incoming packet. Rather, as noted above, this section of KADAMBI et al. merely discloses that the filters are defined

by a rules table. Therefore, this section of KADAMBI et al. does not disclose or suggest programming a filter to perform a first lookup operation in a first forwarding table if a first field value of a received packet meets one or more conditions of a first set of conditions and programming the filter to initiate a second lookup operation in a second forwarding table if the first field value does not meet one or more conditions of the first set of conditions, as recited in amended claim 10.

At column 20, line 65 – column 21, line 15, KADAMBI et al. discloses:

If the filter is designated as an exclusive filter, the filter will exclude all packets unless there is a match. In other words, the exclusive filter allows a packet to go through the forwarding process only if there is a filter match. If there is no filter match, the packet is dropped. In an inclusive filter, if there is no match, no action is taken but the packet is not dropped. Action on an exclusive filter requires an exact match of all filter fields. If there is an exact match with an exclusive filter, therefore, action is taken as specified in the action field; the actions which may be taken, are discussed above. If there is no full match or exact of all of the filter fields, but there is a partial match, then the packet is dropped. A partial match is defined as either a match on the ingress field, egress field, or filter select fields. If there is neither a full match nor a partial match with the packet and the exclusive filter, then no action is taken and the packet proceeds through the forwarding process.

This section of KADAMBI et al. discloses that, if the filter is an exclusive filter, the filter will drop all packets that are not a match. This section of KADAMBI et al. further discloses that if the filter is an inclusive filter, if there is no match, no action is taken, but the packet is not dropped. This section of KADAMBI et al. does not disclose or suggest that the filters are programmed to perform a lookup operation in different forwarding tables based upon one or more conditions of the incoming packet. Rather, as noted above, this section of KADAMBI et al. discloses filters that determine if incoming packets are matches. Therefore, this section of KADAMBI et al. does not disclose or suggest programming a filter to perform a first lookup operation in a first forwarding table if a first field value of a received packet meets one or more conditions of a first set

of conditions and programming the filter to initiate a second lookup operation in a second forwarding table if the first field value does not meet one or more conditions of the first set of conditions, as recited in amended claim 10.

At column 21, lines 25-44, KADAMBI et al. discloses:

In summary, the FFP includes a filter database with eight sets of inclusive filters and eight sets of exclusive filters, as separate filter masks. As a packet comes into the FFP, the filter masks are applied to the packet; in other words, a logical AND operation is performed with the mask and the packet. If there is a match, the matching entries are applied to rules tables 22, in order to determine which specific actions will be taken. As mentioned previously, the actions include 802.1p tag insertion, 802.1p priority mapping, IP TOS (type-of-service) tag insertion, sending of the packet to the CPU, discarding or dropping of the packet, forwarding the packet to an egress port, and sending the packet to the mirrored port. Since there are a limited number of fields in the rules table, and since particular rules must be applied for various types of packets, the rules table requirements are minimized in the present invention by the present invention setting all incoming packets to be "tagged" packets; all untagged packets, therefore, are subject to 802.1p tag insertion, in order to reduce the number of entries which are necessary in the rules table.

This section of KADAMBI et al. discloses that, when a packet enters the fast filtering processor (FFP), filters are applied to a mask and, if there is a match, the matching entries are applied to a rules table to determine which actions will be taken. This section of KADAMBI et al. does not disclose performing lookup operations in different forwarding tables based upon one or more conditions of the received packets. Rather, KADAMBI et al. discloses applying matching entries to determine which action, such as 802.1p tag insertion, 802.1p priority mapping, IP type-of-service tag insertion, sending of the packet to the CPU, discarding or dropping of the packet, forwarding the packet to an egress port, and sending the packet to the mirrored port, should be taken with respect to the packet. This section of KADAMBI et al. does not even disclose multiple forwarding tables. Therefore, this section of KADAMBI et al. does not disclose or suggest programming a filter to perform a first lookup operation in a first forwarding table if a first field value of

a received packet meets one or more conditions of a first set of conditions and programming the filter to initiate a second lookup operation in a second forwarding table if the first field value does not meet one or more conditions of the first set of conditions, as recited in amended claim 10.

At column 22, lines 22-52 (which describes elements 17-1 to 17-7), KADAMBI et al. discloses:

As mentioned previously, FFP 141 is programmed by the user, through CPU 52, based upon the specific functions which are sought to be handled by each FFP 141. Referring to FIG. 17, it can be seen that in step 17-1, an FFP programming step is initiated by the user. Once programming has been initiated, the user identifies the protocol fields of the packet which are to be of interest for the filter, in step 17-2. In step 17-3, the packet type and filter conditions are determined, and in step 17-4, a filter mask is constructed based upon the identified packet type, and the desired filter conditions. The filter mask is essentially a bit map which is applied or ANDed with selected fields of the packet. After the filter mask is constructed, it is then determined whether the filter will be an inclusive or exclusive filter, depending upon the problems which are sought to be solved, the packets which are sought to be forwarded, actions sought to be taken, etc. In step 17-6, it is determined whether or not the filter is on the ingress port, and in step 17-7, it is determined whether or not the filter is on the egress port. If the filter is on the ingress port, an ingress port mask is used in step 17-8. If it is determined that the filter will be on the egress port, then an egress mask is used in step 17-9. Based upon these steps, a rules table entry for rules tables 22 is then constructed, and the entry or entries are placed into the appropriate rules table (steps 17-10 and 17-11). These steps are taken through the user inputting particular sets of rules and information into CPU 52 by an appropriate input device, and CPU 52 taking the appropriate action with respect to creating the filters, through CMIC 40 and the appropriate ingress or egress submodules on an appropriate EPIC module 20 or GPIC module 30.

This section of KADAMBI et al. discloses constructing a filter mask based upon a packet type and user-identified filter conditions. This section of KADAMBI et al. further discloses that a rules table entry is constructed and the entry is placed in appropriate rules tables. This section of KADAMBI et al. discloses constructing entries for rules tables. This section of KADAMBI et al. does not disclose performing lookup operations in different forwarding tables based upon one or more conditions of the received packets.

Therefore, this section of KADAMBI et al. does not disclose or suggest programming a filter to perform a first lookup operation in a first forwarding table if a first field value of a received packet meets one or more conditions of a first set of conditions and programming the filter to initiate a second lookup operation in a second forwarding table if the first field value does not meet one or more conditions of the first set of conditions, as recited in amended claim 10.

Since ANDERSSON et al. and KADAMBI et al. do not disclose or suggest programming a filter to perform a first lookup operation in a first forwarding table if a first field value of a received packet meets one or more conditions of a first set of conditions and programming the filter to initiate a second lookup operation in a second forwarding table if the first field value does not meet one or more conditions of the first set of conditions, as recited in amended claim 10, ANDERSSON et al. and KADAMBI et al. cannot disclose or suggest performing the first lookup operation in the first forwarding table, without performing the second lookup operation in the second forwarding table, to identify a first egress port, of the networking device, when the first field value of the particular packet meets the one or more conditions, and performing the second lookup operation in the second forwarding table, without performing the first lookup operation in the first forwarding table, to identify a second egress port, of the networking device, when the first field value of the particular packet does not meet the one or more conditions, as further recited in amended independent claim 10.

For at least the foregoing reasons, Applicants submit that claim 10 is patentable over ANDERSSON et al. and KADAMBI et al., whether taken alone or in any reasonable combination.

Claims 11 and 12 depend from claim 10. Therefore, these claims are patentable over ANDERSSON et al. and KADAMBI et al., whether taken alone or in any reasonable combination, for at least the reasons given above with respect to claim 10.

Independent claims 17 and 27 recite features similar to (yet possibly of different scope than) features described above with respect to claim 10. Therefore, Applicants submit that claims 17 and 27 are patentable over ANDERSSON et al. and KADAMBI et al., whether taken alone or in any reasonable combination, for at least reasons similar to reasons given above with respect to claim 10.

Claims 18-20 depend from claim 17. Therefore, these claims are patentable over ANDERSSON et al. and KADAMBI et al., whether taken alone or in any reasonable combination, for at least the reasons given above with respect to claim 17.

Claims 28 and 29 depend from claim 27. Therefore, these claims are patentable over ANDERSSON et al. and KADAMBI et al., whether taken alone or in any reasonable combination, for at least the reasons given above with respect to claim 27.

**Rejection under 35 U.S.C. § 103(a) based on AGGARWAL et al. and
KADAMBI et al.**

Claims 21-26 stand rejected under 35 U.S.C. § 103(a) as allegedly unpatentable over AGGARWAL et al. and KADAMBI et al. Applicants respectfully traverse this rejection.

Claim 21 recites, in a router containing a plurality of forwarding tables, a method of packet forwarding that includes receiving a packet at an ingress interface; classifying the received packet based on at least a first field value contained in the header of the packet; associating one of the plurality of forwarding tables to the packet according to its

classification; performing a lookup operation in the associated forwarding table according to at least a second field value contained in the header of the packet; determining an egress interface based on the lookup operation; and transmitting the received packet from the determined egress interface. AGGARWAL et al. and KADAMBI et al., whether taken alone or in any reasonable combination, do not disclose or suggest this combination of features.

For example, AGGARWAL et al. and KADAMBI et al. do not disclose or suggest associating one of a plurality of forwarding tables to a packet according to its classification. The Examiner admits that AGGARWAL et al. does not disclose this feature of claim 21 and relies on Figs. 20 and 21 and column 35, lines 27-54 (which describes Fig. 20) of KADAMBI et al. as allegedly disclosing this feature of claim 21 (Office Action, pg. 16). Applicants respectfully disagree with the Examiner's interpretation of KADAMBI et al.

At Fig. 21, KADAMBI et al. discloses a single unified table that is used to store L2, L3, and L4 information, along with filtering values (column 35, lines 55-58). KADAMBI et al. does not disclose or suggest associating the table to a packet according to the packet's classification. Rather, KADAMBI et al. merely discloses that the table stores L2, L3, and L4 information and filtering values. Therefore, Fig. 21 of KADAMBI et al. does not disclose or suggest associating one of a plurality of forwarding tables to a packet according to its classification, as recited in claim 21.

At column 35, lines 27-54, KADAMBI et al. discloses:

In general, the ARL is an important component in SOC 10. For an L2 switch, as noted above, the main function of the ARL is to identify the destination port(s), depending upon the MAC address. For an L3 switch, the ARL not only identifies the destination port, but also modifies the IP and MAC headers of the packet in

accordance with the forwarding rules of IP routing. As such, an L2 switch generally utilizes a MAC address table to look for the destination and source MAC addresses along with the VLAN ID. Following this configuration, an L3 switch generally utilizes an IP Router table to find the longest prefix match from the destination IP address. L4 switches generally include an additional table, an L4 lookup table, that utilizes a socket number, which is defined as, for example, IP address+TCP+UDP port number, for a lookup and to make packet forwarding decisions based upon the L4 information within the L4 lookup table. Furthermore, for the switches that support packet classification based upon certain protocol headers, filtering logic is generally implemented in a filtering component of ARL. This filtering component generally utilizes an additional filtering table in order to classify packets for possible filtering action. This general configuration for ARL and filtering logic is shown in FIG. 20. Although the configuration shown in FIG. 20 simplifies the logic necessary to access the respective tables, it also operates to increase the memory overhead of the chip, while decreasing the memory usage efficiency as a result of identical entries being stored in multiple tables within a single chip.

This section of KADAMBI et al. discloses an L4 lookup table to make packet forwarding decisions based upon the L4 information within the L4 lookup table. This section of KADAMBI et al. discloses a single L4 lookup table used to make packet forwarding decisions. This section of KADAMBI et al. does not disclose associating one of a plurality of L4 lookup tables with a packet according to the packet's classification. Therefore, this section of KADAMBI et al. does not disclose or suggest associating one of a plurality of forwarding tables to a packet according to its classification, as recited in claim 21.

For at least the foregoing reason, Applicants submit that claim 21 is patentable over AGGARWAL et al. and KADAMBI et al., whether taken alone or in any reasonable combination.

Claims 22-25 depend from claim 21. Therefore, these claims are patentable over AGGARWAL et al. and KADAMBI et al., whether taken alone or in any reasonable combination, for at least the reasons given above with respect to claim 21.

Amended independent claim 26 recites features similar to, yet possibly of

different scope than, features recited above with respect to claim 21. Therefore, amended claim 26 is patentable over AGGARWAL et al. and KADAMBI et al., whether taken alone or in any reasonable combination, for at least reasons similar to the reasons given above with respect to claim 21.

CONCLUSION

In view of the foregoing amendments and remarks, Applicants respectfully request the Examiner's reconsideration of the application and the timely allowance of the pending claims.

If the Examiner believes that the application is not now in condition for allowance, Applicant respectfully requests that the Examiner contact the undersigned to discuss any outstanding issues.

As Applicant's remarks with respect to the Examiner's rejections overcome the rejections, Applicant's silence as to certain assertions by the Examiner in the Office Action or certain requirements that may be applicable to such assertions (e.g., whether a reference constitutes prior art, reasons to modify a reference and/or combine references, assertions regarding dependent claims, etc.) is not a concession by Applicant that such assertions are accurate or that such requirements have been met, and Applicant reserves the right to dispute these assertions/requirements in the future.

To the extent necessary, a petition for an extension of time under 37 C.F.R. § 1.136 is hereby made. Please charge any shortage in fees due in connection with the filing of this paper, including extension of time fees, to Deposit Account No. 50-1070 and please credit any excess fees to such deposit account.

Respectfully submitted,

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